

awareness. The situational awareness ratings for the SV PFD were largely due to the egocentric view that gave pilots an immersed sense of terrain around them. Pilot awareness and the capability for avoiding hazardous conditions were significantly enhanced with the addition of

3D exocentric navigation display modes that allowed for a greater field-of-regard to confirm the presence of hazards along their planned routing. The combination of SV primary flight and navigation display concepts allowed pilots to make the best and quickest decisions re-

garding safety of their aircraft.

This work was done by Lawrence J. Prinzel III, Lynda J. Kramer, J.J. Arthur III, and Randall E. Bailey of Langley Research Center and Jason L. Sweeters of NCI Information Systems, Inc. Further information is contained in a TSP (see page 1). LAR-17354

Automated Camera Array Fine Calibration

NASA's Jet Propulsion Laboratory, Pasadena, California

Using aerial imagery, the JPL FineCalibration (JPL FineCal) software automatically tunes a set of existing CAHVOR camera models for an array of cameras. The software finds matching features in the overlap region between images from adjacent cameras, and uses these features to refine the camera models. It is not necessary to take special imagery of a known target and no surveying is required.

JPL FineCal was developed for use with an aerial, persistent surveillance platform. Synchronized images from an array of cameras are captured and stitched together into a single, very high-resolution image that is projected onto an elevation map of the ground. A GUI

(graphical user interface) tool allows the user to play a movie of any part of the imaged surface from any perspective.

JPL FineCal requires, as input, a set of CAHVOR camera models for the camera array. These models are typically developed on the ground using a calibration procedure requiring a known target at a short distance. JPL FineCal corrects the inaccuracy of the camera model extrinsic parameters resulting from the short target distance by using imagery, taken during flight, at an effective distance of infinity. It also makes small improvements to the intrinsic parameters.

JPL FineCal is an automated process that does not require the use of any

special targets, and which may be applied during normal flight operations. Thus, it makes it simple to retune the camera models to correct for small misalignments that occur due to changes in aperture settings, vibration, or thermal changes.

This work was done by Daniel Clouse, Curtis Padgett, Adnan Ansar, and Yang Cheng of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

The software used in this innovation is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45715.

Multichannel Networked Phasemeter Readout and Analysis

NASA's Jet Propulsion Laboratory, Pasadena, California

Netmeter software reads a data stream from up to 250 networked phasemeters, synchronizes the data, saves the reduced data to disk (after applying a low-pass filter), and provides a Web server interface for remote control. Unlike older phasemeter software that requires a special, real-time operating system, this program can run on any general-purpose computer. It needs about five percent of the CPU (central processing unit) to process 20 channels because it adds built-in data logging and network-based

GUIs (graphical user interfaces) that are implemented in Scalable Vector Graphics (SVG).

Netmeter runs on Linux and Windows. It displays the instantaneous displacements measured by several phasemeters at a user-selectable rate, up to 1 kHz. The program monitors the measure and reference channel frequencies. For ease of use, levels of status in Netmeter are color coded: green for normal operation, yellow for network errors, and red for optical misalignment problems. Netmeter in-

cludes user-selectable filters up to 4 k samples, and user-selectable averaging windows (after filtering). Before filtering, the program saves raw data to disk using a burst-write technique.

This work was done by Shanti Rao of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-45505.

MISR Instrument Data Visualization

NASA's Jet Propulsion Laboratory, Pasadena, California

The MISR Interactive eXplorer (MINX) software functions both as a general-purpose tool to visualize Multi-angle Imaging SpectroRadiometer (MISR) instrument data, and as a spe-

cialized tool to analyze properties of smoke, dust, and volcanic plumes. It includes high-level options to create map views of MISR orbit locations; scrollable, single-camera RGB (red-green-

blue) images of MISR level 1B2 (L1B2) radiance data; and animations of the nine MISR camera images that provide a 3D perspective of the scenes that MISR has acquired.